San José State University
Department of Computer Science
CS271.01, Topics in Machine Learning,
Section 1, Spring, 2022

Course and Contact Information

Instructor(s): Genya Ishigaki
Office Location: MH 215
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Office Hours:

- Mondays 1:15 PM - 3:00 PM (Zoom)
- By appointment

Class Days/Time: Mondays & Wednesdays 12:00 PM - 1:15 PM
Classroom: Hybrid

- If not specified, the classes will be conducted on Zoom.
- In-person sessions will be specified in the course schedule. The classroom for the in-person sessions is MacQuarrie Hall 225.

Prerequisites: CS 157A. Limited to MSCS, MSBI, and MSDS students.

Course Description

Introduction to reinforcement learning, deep reinforcement learning, other online learning algorithms, and their applications.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on Canvas Learning Management System course login website. You are responsible for regularly checking with the messaging system through MySJSU on Spartan App Portal (or other communication system as indicated by the instructor) to learn of any updates. For help with using Canvas see Canvas Student Resources page.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

1. Distinguish different types of reinforcement learning algorithms and when to use them.
2. Describe the benefits and potential challenges of deep reinforcement learning.
3. Apply reinforcement learning algorithms to real-world problems.
4. Analyze and evaluate the performance of reinforcement algorithms.
5. Create a machine learning project to solve a social or technical issue.

Required Texts/Readings

Textbook

Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction (Second edition)", MIT press, ISBN-10: 0262039249, 2018. [Available online: http://incompleteideas.net/book/RLbook2020.pdf]

Other Readings

- Open AI, "Spinning Up in Deep RL," [Available online: https://spinningup.openai.com/en/latest/]
- (Optional) Yoav Shoham and Kevin Leyton-Brown, Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations, Cambridge University Press, 2009. [Available online: http://www.masfoundations.org/download.html]

Other technology requirements / equipment / material

- Laptop
- Python development environment
- LaTeX (*Recommended for Project Paper)

Course Requirements and Assignments

- Three assignments
- Two exams
- One project presentation (separated in three phases)
- One project paper
    - Major programming contribution from **each** group member is required for a passing grade. Details will be explained in class.

University Policy S16-9, Course Syllabi requires the following language to be included in the syllabus:

"Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation/studying, or course related activities, including but not limited to internships, labs, and clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus."

Final Examination or Evaluation

- This course is designed as a research-oriented course so that students can experience a process of machine learning projects: problem formulation, modeling, method selection, and development.
    - The final project requires students to apply (deep) reinforcement learning to some practical problems.
    - It is recommended to form a group of TWO students. I may approve exceptions (individual or group of three) with a valid reason.
    - Some example topics will be presented and discussed during a class, but students can choose any topic that they found interesting.
- All exams are planned to be conducted during the regular class hours.
    - [Note for Spring 2022] The exam format may be altered to *take-home*, depending on the COVID situation. The announcement will be made during the class and through Canvas.
- Assignments may include both theoretical and programming questions.

Grading Information

Item	% in Final Grade
Exam 1	16 %
Exam 2	16 %
Assignment 1	13 %
Assignment 2	13 %
Assignment 3	13 %
Project Idea/Proposal Presentations	5 %
Project Final Presentation	8 %
Project Paper	16 %

Determination of Grades

- Extra credit questions may be given in assignments and exams.
- Late submissions within 24 hours will be deducted 10% of its final grade. Submissions over 24 hours late will have 20% grade deducted. Late submissions over 2 days will not be accepted.

Total Grade	Letter Grade
97% and above	A plus
92% to 96%	A
90% to 91%	A minus
87% to 89%	B plus
82% to 86%	B
80% to 81%	B minus
77% to 79%	C plus
72% to 76%	C
70% to 71%	C minus
67% to 69%	D plus
62% to 66%	D
60% to 61%	D minus
59% and below	F

University Policies

Per University Policy S16-9 ,relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on Syllabus Information web page (https://www.sjsu.edu/curriculum/courses/syllabus-info.php). Make sure to visit this page to review and be aware of these university policies and resources.

CS 271.01 / Topics in Machine Learning, Spring 2022, Course Schedule

Course Schedule

Week	Date	Topics, Readings, Assignments, Deadlines
1	1/26	What is Learning?
2	1/31 2/2	Markov Decision Processes
3	2/7 2/9	Dynamic Programming
4	2/14 2/16	Model-free prediction Assignment 1
5	2/21 2/23	Model-free control Approximation
6	2/28 3/2	Review and Exam 1 Assignment 2
7	3/7 3/9	Deep Reinforcement Learning
8	3/14 3/16	Multi-Armed Bandit (MAB)
9	3/21 3/23	Application of RL
10	4/4 4/6	Integrating Learning and Planning
11	4/11 4/13	Policy Gradient Methods
12	4/18 4/20	Project Proposal Presentation Project - Proposal slides
13	4/25 4/27	Review and Exam 2 Assignment 3
14	5/2 5/4	Distributed and Federated RL
15	5/9 5/11	Advanced topics: Explainable RL
16	5/16	Final Presentation Project - Final presentation slides
Final Exam	5/20	Project - Project paper